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EXAMINER

EARLY, MICHAEL JACOBY

ART UNIT	PAPER NUMBER
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3744

DATE MAILED: 09/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/763,303	Applicant(s) GHOSHAL ET AL.	
	Examiner Michael J. Early	Art Unit 3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 2-10 and 20-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 11-19 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>See Continuation Sheet</u> . | 6) <input type="checkbox"/> Other: _____ |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :1/23/04; 2/15/05; 9/8/05; 9/12/05.

DETAILED ACTION

Election/Restrictions

Claims 2-10 and 20-22 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 7/11/06.

Applicant's election without traverse of Group V in the reply filed on 7/11/06 is acknowledged.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 11-19 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ghoshal et al. (U.S. 6,658,861 B1).

Regarding claims 1 and 11, Ghoshal et al. ('861) disclose a system (200 – system) comprising:

- a liquid metal chamber (201 – solid-fluid heat exchanger) placed in a thermal transfer path from the high power density device (202 – high power density device) (as seen in Figure 2);
- means for cooling (209 – heat sink) the liquid metal, the cooling means being placed at a predefined distance away from the liquid metal chamber (see col. 4, lines 5-39; Figure 2);
- at least one conduit (203 – conduit) traversing the liquid metal chamber and the cooling means in the form of a closed loop (as seen in Figure 2), the conduit circulating the liquid metal between the liquid metal chamber and the cooling means (see col. 3, line 65 – col. 4, line 10);
- at least one electromagnetic pump (211 – electromagnetic pump) for pumping the liquid metal through the conduit, wherein heat is transferred away from the high power density device to the cooling means through the liquid metal contained in the conduit, the liquid metal being circulated in the conduit by the electromagnetic pump (see col. 4, lines 11-27; Figure 2);

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- the thermal transfer pathway includes a pipe (703 – conduit).

Regarding claims 12-17, Ghoshal et al. ('861) further disclose a system (apparatus) comprising:

- a pipe (703 – conduit) placed adjacent to the high power density device (the high power density device is placed adjacent to the solid-fluid heat exchanger [701], which is adjacent to the conduit [703]; see col. 8, lines 43-45; Figure 7);
- a heat exchanger (705 – fluid-fluid heat exchanger), the heat exchanger containing liquid metal (because conduits [703, 711] contain liquid metal and also pass through the fluid-fluid heat exchanger [705], the fluid-fluid heat exchanger [705] must also contain liquid metal), the heat exchanger (705 – fluid-fluid heat exchanger) transferring heat from the pipe (703 – conduit) to the liquid metal (liquid metal in conduit [717]; col. 8, lines 56-58; Figure 7);
- means for cooling (719 – heat sink) the liquid metal (see col. 8, line 40 – col. 9, line 10), the cooling means being placed at a predefined distance away from the heat exchanger (as seen in Figure 7);
- at least one conduit (717 –conduit) traversing the heat exchanger and the cooling means in the form of a closed loop (see col. 8, line 40 – col. 9, line 10; Figure 7), the conduit containing the liquid metal (see co. 8, line 56-58), the conduit circulating the liquid metal between the heat exchanger and the cooling means (as seen in Figure 7);
- heat is transferred away from the high power density device to the cooling means through the combination of the pipe and the conduit (see col. 8, line 62 – col. 9, line 5);
- the high power density device is located in a folding electronic device (see col. 9, lines 24-28);
- the conduit is constructed using a flexible material to allow bending (see col. 9, lines 27-34);

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- a flexible portion for transferring the liquid metal across a bend (see col. 9, lines 27-34);
- the conduit includes a hinge, the hinge permitting rotation between parts of the conduit (see col. 9, lines 27-34);
- the high power density device is an integrated circuit (see col. 4, lines 59-65).

Regarding claims 18, 19 and 23; Ghoshal et al. ('861) further disclose a method; which dissipates heat (see col. 8, lines 43-61) from a high power density device (the high power density device is placed adjacent to the solid-fluid heat exchanger [701], which is adjacent to the conduit [703]; see col. 8, lines 43-45; Figure 7), the high power density device placed adjacent to a pipe (703 – conduit; Figure 7), that is capable of being performed by the aforementioned apparatus and comprises the steps of:

- a transferring heat from the high power density device (the high power density device is placed adjacent to the solid-fluid heat exchanger [701], which is adjacent to the conduit [703]; see col. 8, lines 43-45; Figure 7) to the pipe (703 – conduit), the pipe transporting heat a predefined distance away from the high power density device (see col. 8, lines 43-61; Figure 7);
- transferring heat from the pipe to a liquid metal system (705, 717, 719 – fluid-fluid heat exchanger, conduit, heat sink) (see col. 8, lines 43-61; Figure 7);
- dissipating heat using the liquid metal system (see col. 8, line 62 – col. 9, line 5; Figure 7);
- the step of transferring heat from the liquid metal loop system to a heat sink (see col. 8, line 62 – col. 9, line 5; Figure 7);
- transferring heat across a bend in a folding electronic device using the liquid metal system (see col. 9, lines 24-28).

Ghoshal et al. ('861) do not expressly disclose:

- a heat pipe;
- a liquid-heat pipe heat exchanger.

Ghoshal et al. ('861) further teach that it is well known in the art that heat pipes are used to extract heat from high power density devices dissipate the heat at another location (see col. 1, lines 54 – col. 2, line 5). Ghoshal et al. ('861) further disclose forced fluid cooling is an attractive option to cooling HPDDs. Further disclosed is that by circulating the forced fluid through the HPDD, the heat from the HPDD is carried away and dissipated at a sink placed at a distance (see col. 2, lines 21-36).

Regarding claims 11-19 and 23, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Ghoshal et al. ('861) by incorporating a heat pipe, in cooperation with the existing electromagnetic pump, as a means of transferring heat away from the high power density device (HPDD), because the modification would allow for effective removal of the excessive temperature buildup that is generated by HPDDs through a means of forced fluid flow, thus decreasing the number of malfunctions, breakdowns and problems associated with interface resistance that occur in HPDDs.

In addition, this incorporation of a heat pipe to transfer heat away from the high power density device, would obviously result in the conversion of Ghoshal et al.'s ('861) fluid-fluid heat exchanger into a liquid-heat pipe heat exchanger.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claim 1 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,658,861 B1. Although the conflicting claims are not identical, they are not patentably distinct from each other because each claim recites a system comprising:

- a liquid metal chamber placed in a thermal transfer path from the high power density device;
- a means for cooling the liquid metal that is placed at a predefined distance away from the liquid metal chamber;
- at least one conduit traversing the liquid metal chamber and the cooling means in the form of a closed loop, which also circulates liquid metal between the liquid metal chamber and the cooling means;

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- at least one electromagnetic pump for pumping the liquid metal through the conduit.

Claims 11 and 12 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,658,861 B1 in view of Sekhon et al. (U.S. 4,047,198).

As aforementioned Ghoshal et al. ('861) recite a majority of the limitations recited in claim 1 of the present application, however; do not recite a heat pipe.

Sekhon et al. teach of the advantages associated with heat pipe cooling techniques. Sekhon et al. further disclose that heat pipes provide extremely high values of thermal conductance in high power density applications (see col. 2, lines 3-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Ghoshal et al. ('861) by incorporating a heat pipe to efficiently dissipate heat from the high power density device, as taught by Sekhon et al., so to reduce the problems associated with the high temperatures and over-heating of high power density devices, thus extending the lifetime of the device and in improving the system's overall efficiency.

Claims 18 and 19 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 14 of U.S. Patent No. 6,658,861 B1 in view of Sekhon et al. (U.S. 4,047,198).

Ghoshal et al. ('861) further recite a method comprising:

- transferring heat from a high power density device to liquid metal that is enclosed within a heat exchanger;

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- transferring the liquid metal to a heat sink that is placed at a predetermined distance from the heat exchanger;
- dissipating heat at the heat sink.

Ghoshal et al. ('861) do not recite:

- a heat pipe.

As aforementioned, Sekhon et al. teach of the benefits associated with using heat pipes in high power density applications.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Ghoshal et al. ('861) by incorporating a heat pipe to efficiently dissipate heat from the high power density device, as taught by Sekhon et al., so to reduce the problems associated with the high temperatures and over-heating of high power density devices, thus extending the lifetime of the device and in improving the system's overall efficiency.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Barkan et al. (U.S. 3,812,404) teach of the use of liquid metal to spread heat uniformly within a heat sink.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Early whose telephone number is (571) 272-3681. The examiner can normally be reached on Monday - Friday, 7am - 4:30pm.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler can be reached on (571) 272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MJE
9/18/06

Michael J. Early
Patent Examiner
Art Unit 3744


CHERYL TYLER
SUPERVISORY PATENT EXAMINER

